



This presentation contains potentially disturbing situations or content that may be distressing to some learners.



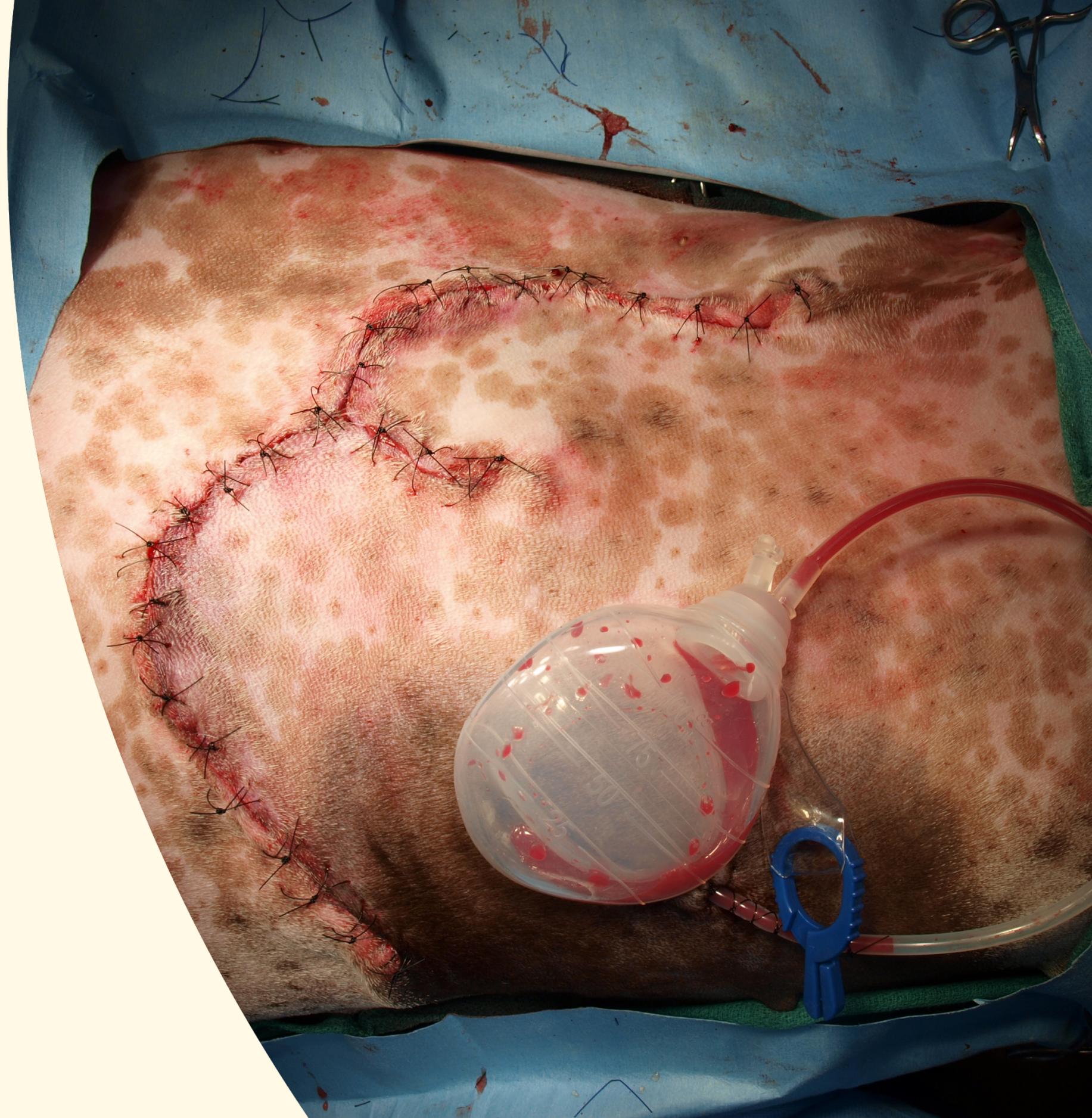
Your Dermis Is Showing Traumatic Wounds From Inflicted to Healed

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Wound Classificati

Wound Basics

Classification

Principles

Practical Wound Care

Triage

Decision making

Closure

Wound Care Tool Box

Products and appropriate use

Wound Classification

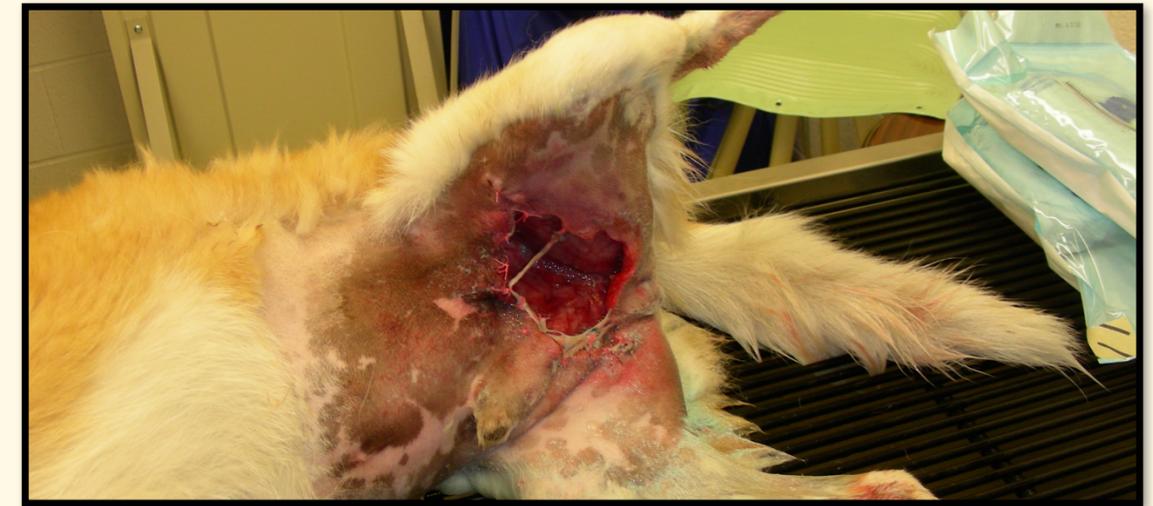
Severity

- Not so bad
- Bad
- Really bad
- OMG

Degree of Contamination

- Clean
- Clean contaminated
- Contaminated
- Dirty/ Infected

All traumatic wounds are at least contaminated



Wound Healing - Phases

Inflammatory

Vascular response
Cellular response

Proliferative

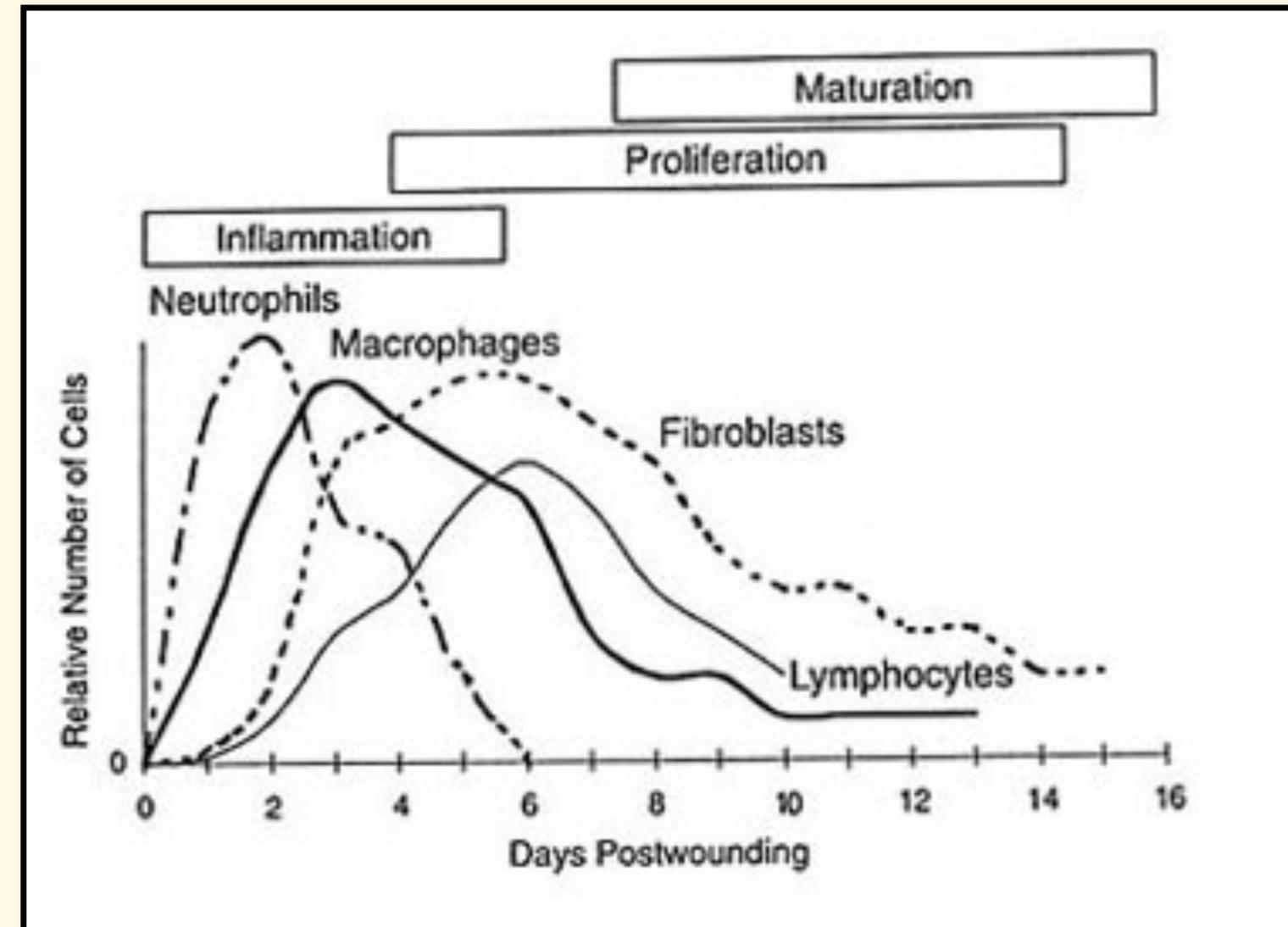
Granulation Tissue!

Remodeling

Collagen magic

No distinct separation between phases

Different parts of the wounds can be in different phases



<http://www.aad.org/education/students/woundhealfig1.htm>



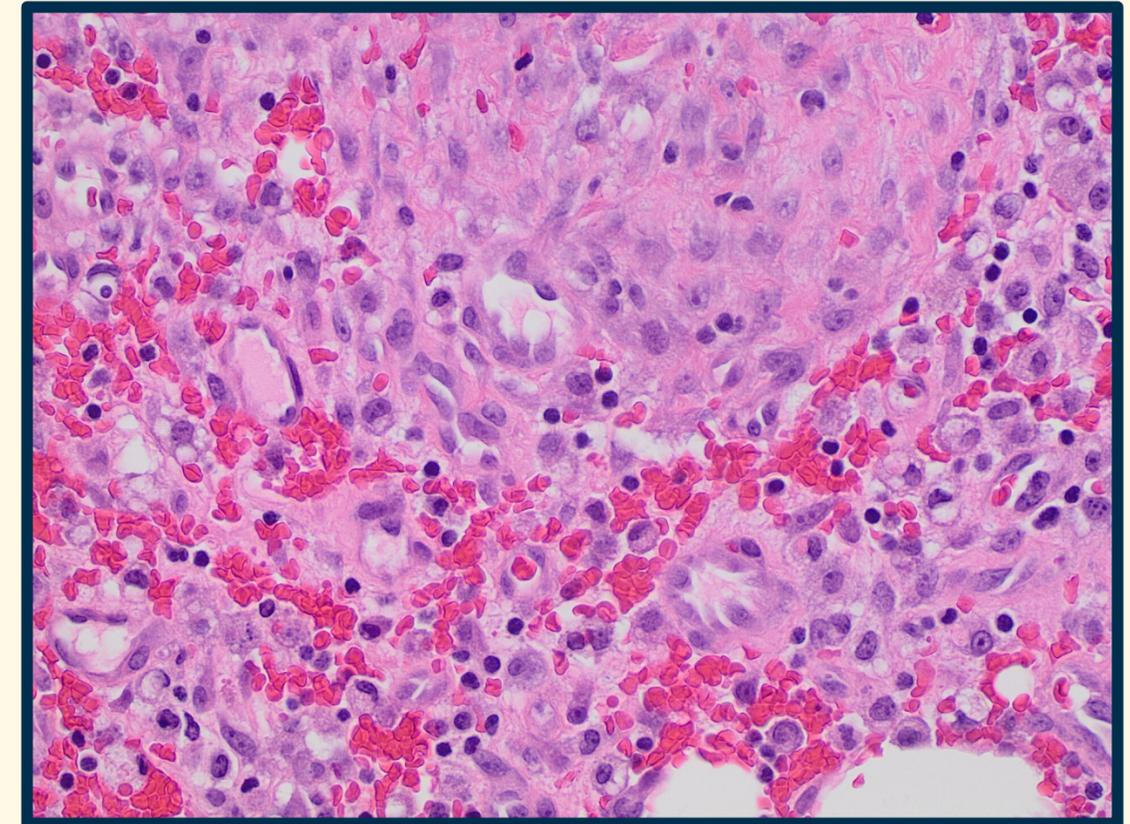
Wound Healing - Phases

Inflammatory Phase

- Neutrophil dominated
- “Lag phase” - damage control, minimal progression in healing

Proliferative Phase

- Macrophages dominate
 - If bacteria are not present
- Macrophage + Fibroblast + Capillary Bed = Granule



A wound can get stuck in the inflammatory phase

Wound Healing - Factors

Systemic Factors

- Protein status
- Endocrine
- Immunosuppressant therapy

How big of a deal is this?

Local Factors

- Infection
- Devitalized tissue
- Foreign material
- Dead Space
- Oxygenation

Usually much more influential

Wound Healing - Surgical Principles

Halstead!

- Aseptic technique
- Gentle tissue handling
- Tension-free closure
- Eliminate dead space



Wound Factors

- Contamination level, presence of debris and necrotic tissue
- Surgical technique, wound care products
- Tension lines, motion, wound size
- Location, motion

Closure

- Primary closure (primary intention)
- Secondary intention
- Delayed primary closure (tertiary intention)

Clinical Approach to Wounds

Triage the Patient

- Prevent further wound contamination
- Stabilize systemically
 - Don't miss the easy stuff - pneumothorax, hemorrhage, neuro, etc.
 - Fluid resuscitation
 - Pain meds

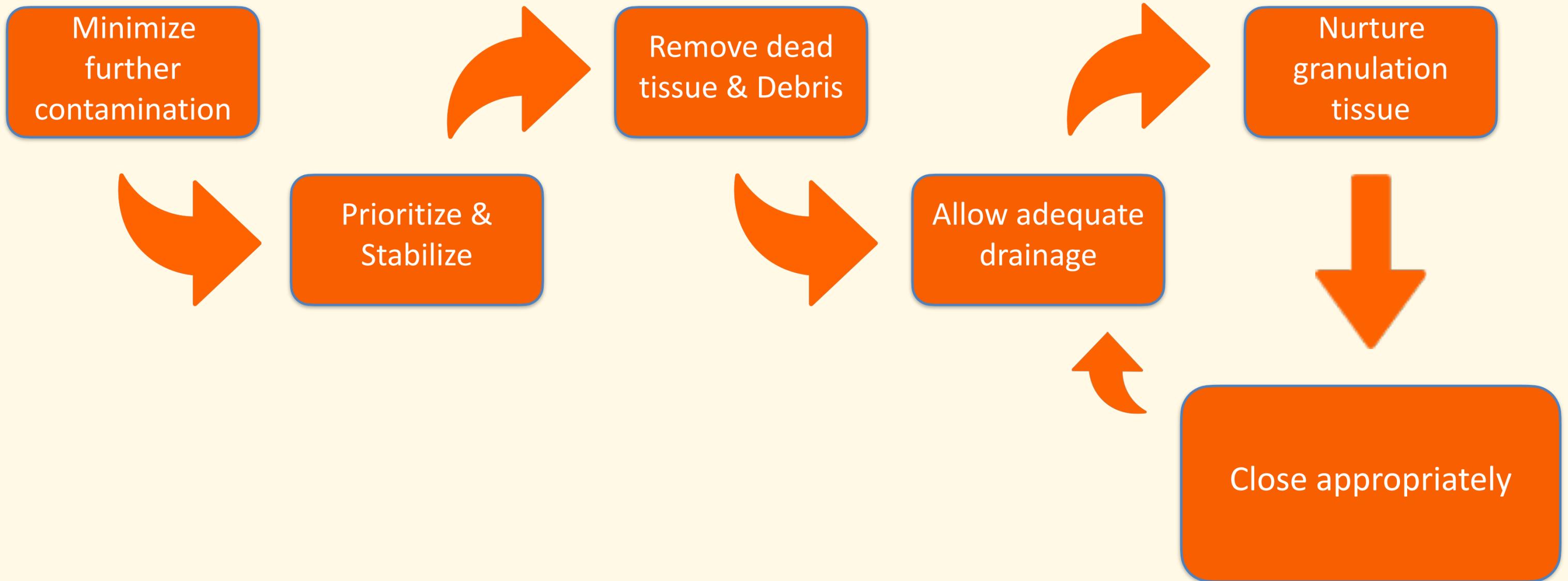
Triage the Wound

- Decontaminate & debridement
- Closure decision
 - Open wound management
 - Closure

Ongoing Wound Management

- Protection
- Drainage
- Goal: Progression of wound

Wound Treatment Progression



Wounds - Triage

Minimize Contamination

- Wear gloves
- Cover wound
 - Non-adherent
 - Stabilization, protection, hemorrhage control
- Get back to the wound later

Systemic Stabilization

Debridement

- Surgical debridement
- Lavage
- Open wound management



Wound Debridement & Lavage

Hair is cheap - and annoying in wounds

- Cover wound - lubricating jelly, moistened sponges, etc.
- Liberal clip

It's a surgical site!

- Barrier material
- Scrub like a surgical site
- Chlorhexidine or iodine
- Saline, not alcohol
- Wound still covered

Surgical & Lavage debridement

- Halstead's principles
- Sterile gloves
- Gentle tissue handling



Surgical Debridement

Take it or leave it?

Debride Aggressively	Conservative Approach
Necrotic muscle, fascia, fat	Tendons
Devitalized bone fragments not needed for stability	Blood vessels
Foreign material in joints	Nerves
Superficial metal	Deep-seated metal
Devitalized skin*	Viable skin*
Foreign material	

Wounds - Lavage

What to use

- Sterile solutions - consider level of contamination
- Isotonic solutions are best
 - No indications to add antibiotics to any lavage solution
- Antiseptic solutions
 - Can cause problems - cytotoxicity
 - Inflammation
 - Delayed healing
 - Questionable effect on established infection
 - Concentration is key

If you must:

1. 0.05% Chlorhexidine
2. 1% Povidone-iodine
3. NO HYDROGEN PEROXIDE!

How to use it

- Appropriate pressure
- Volume!



Wound Lavage

Pressure

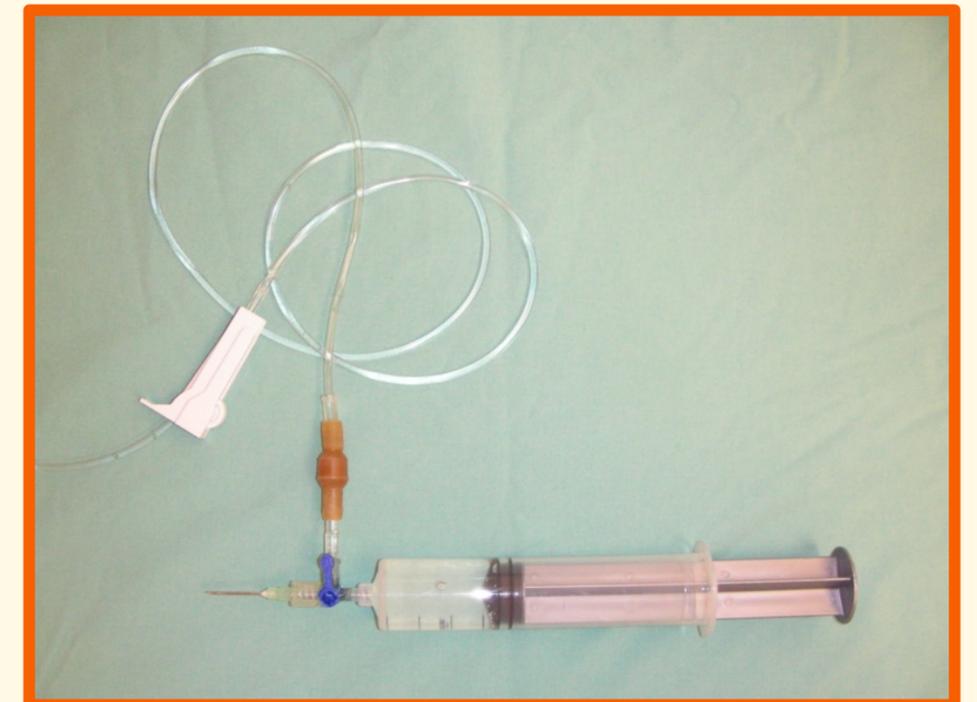
- 6-8 psi

Commercial options

- Often create higher than desired pressure
- Designed for orthopedic surgery
- Single-use, cost concerns

Home-made options

- Cost effective
- Work well



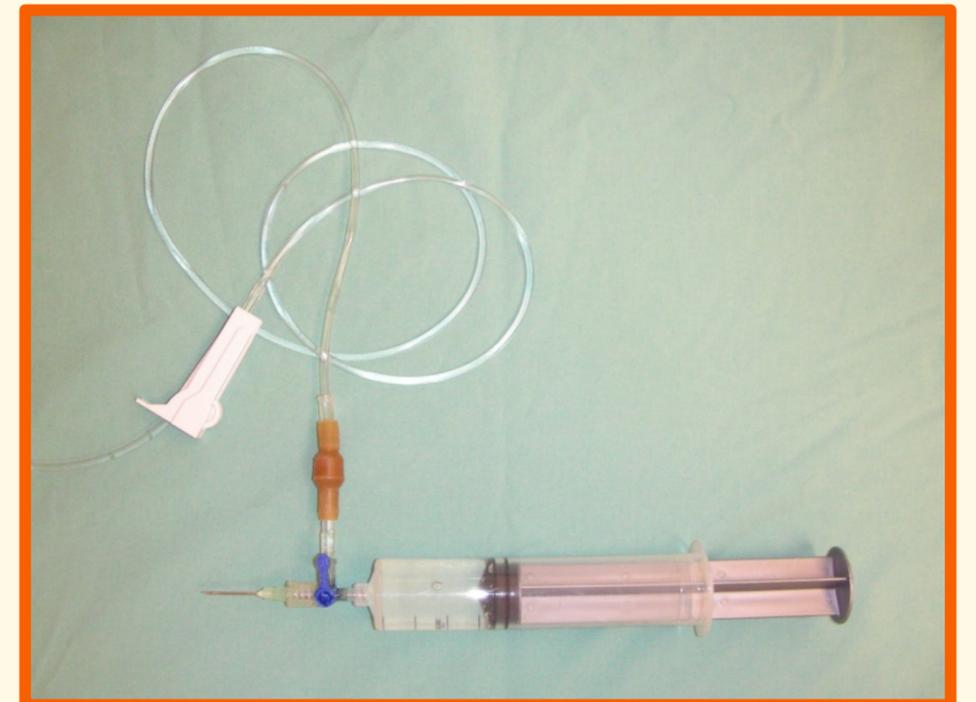
Wound Lavage

Option 1

- 60cc syringe
- 3-way stopcock
- 60 cc syringe
- Needle or catheter (~18 ga)
- Macrobore dripset
- Fluid bag

Option 2

- Same setup as 1
- **Pressure bag** instead of syringe
- Pump pressure to high end of “green”
 - ~300 mmHg



Decisions, Decisions

Debrided and Lavage Done

Now What?

To Close or Not to Close?

- Open wound management and close later
- Primary closure

Considerations

- Wound
- Patient
- Client
- Provider

- Time
- Money
- Risks

Primary Closure

We all want to do it

But!

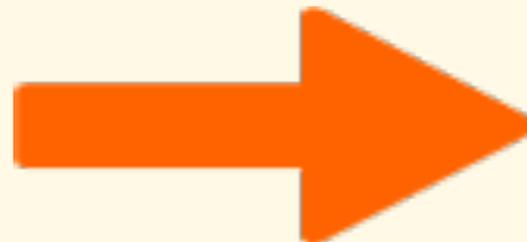
Contamination, drainage, viability issues



Infection, necrosis



Dehiscence



Resist! - If in doubt, leave it open

Open Wound Management

NOT = Leave It Open & Ignore

Product

Less likely to fail

QUESTIONS?

If you have questions about using this template or would like the creative team to review your final slides, [please contact the Creative Strategy & Branding team at creative@aspca.org](mailto:creative@aspca.org).

Primary Closure

Must Consider

- Drainage
- Tension
- Client communication

En bloc removal of wound if possible

Hope is not a strategy...

Drains

- Passive drain
- Active drain



Drains

Passive Drain

- Penrose etc.
- Relies on gravity
- Does not eliminate dead space
- Open to environment - contamination
- Must cover exit sites
- Never exits through original wound
- Unable to quantify fluid production

Active Drain

- Jackson-Pratt (grenade), pancake, etc. Fluted, flat, round drains
- Creates vacuum - no gravity required
- Eliminates dead space
- Closed to environment
- No need to cover exit site
- Never exits through original wound site
- Able to quantify fluid production

Active Drains - Commercial Options

Maintenance

- Need to be reset to work
 - ~1/2 full, on schedule, or both
 - Pressure profile decreases as bulb fills
- Keep a log of fluid produced
- T-shirt or stockinette to cover
- E-collar!

Grenade or Bulb Reservoir

- 100 or 200 ml size
 - So easy to use, a surgeon can do it
- Other options: Pancake (spring loaded)



Drain Tubes

- Sizes vary
- Types vary
 - Fenestrated flat or round
 - Fluted flat or round (Blake)



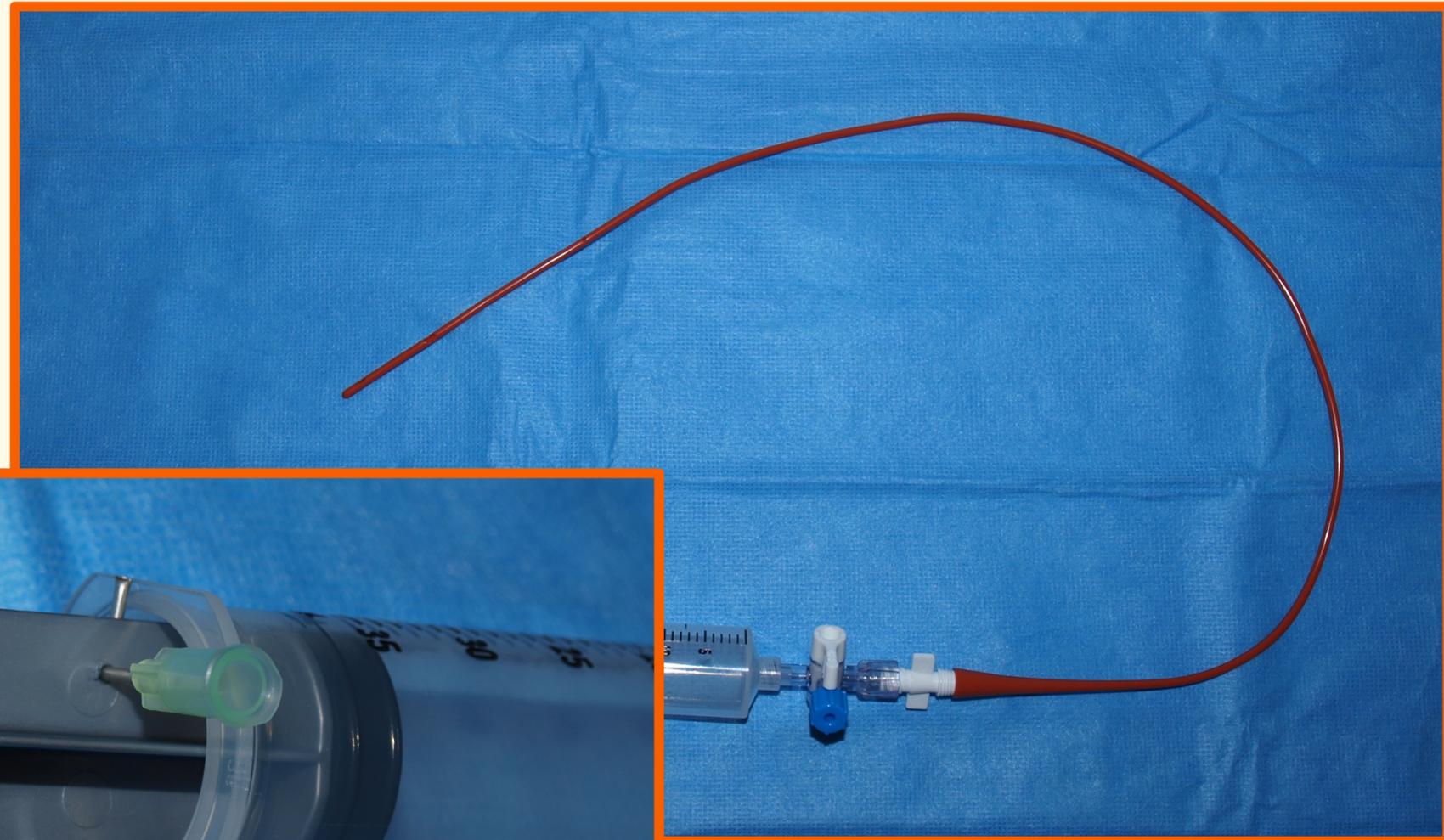
Active Drains - Homecooking

Large Size

- Red rubber catheter - cut side holes to fenestrate
 - $<1/3$ of tube diameter
- 60cc syringe
- 3-Way stopcock
- Large gauge needles (18ga +)

Small Size

- Butterfly catheter - 19ga
 - Cut tiny side holes in tubing
 - Cut off Luer hub
- (Large) Vacutainer



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Open Wound Management

Benefits

- Adequate drainage
- Continuous removal of debris
- Continuous removal of necrotic tissue
- Continuous removal of contaminants
- Enhanced granulation tissue formation
- Help the body help itself

Drawbacks - Time and Money

- May not need extensive periods of open wound management
 - 3-5 days, 1-2 bandage changes
- Products - cost and choices

Open Wound Management

Still need to cover the wound

- Bandage
- Tie-over bandage
- Partial closure with bandage
- So many options

Layers

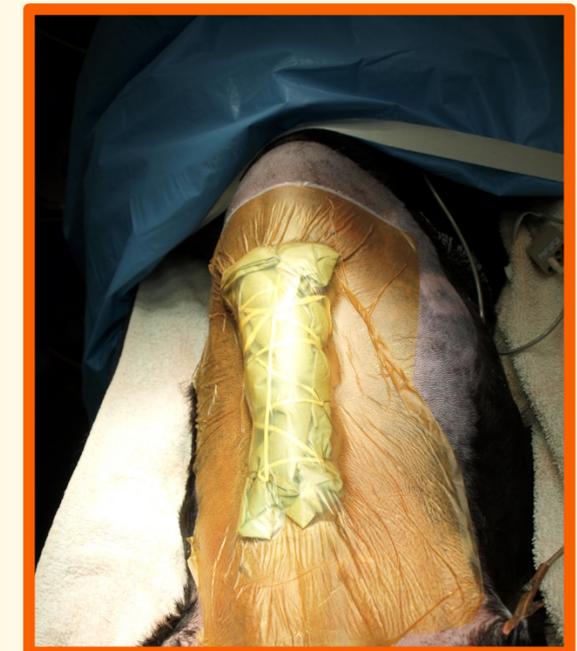
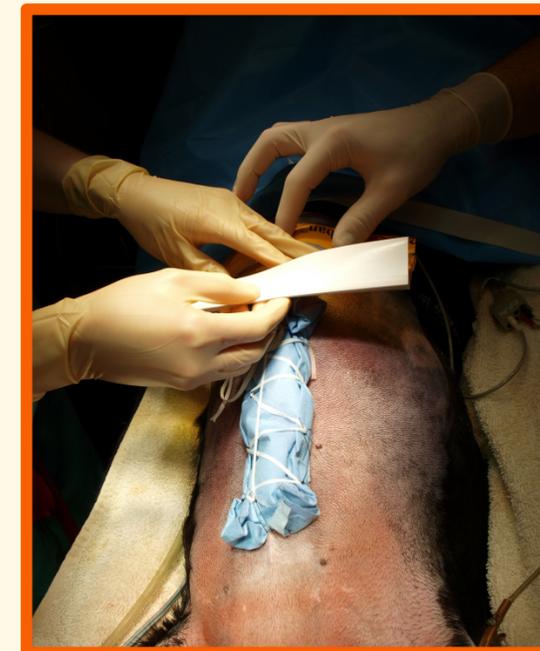
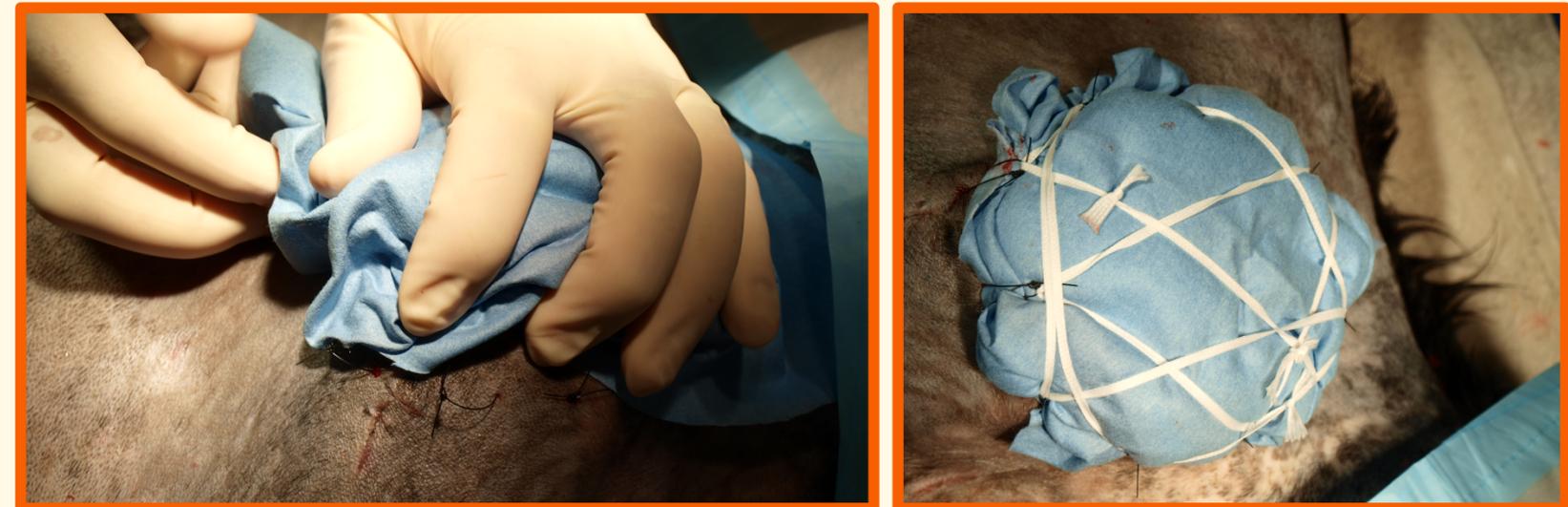
- Primary layer - doing the work
- Secondary layer - absorption, protection
- Tertiary layer - protection, stabilization



Tie-Over Bandage

What I have Learned

- Never too many suture loops
 - Many
 - Close together
- Rightsize the loops to mitigate failure
 - 0 or 2-0
 - Big bites
 - Far enough from wound edge
- Adhesive drapes are magic to cover and keep things in place
 - Tegaderm, Opsite, Ioban, etc.



Open Wound Management

Autolytic vs. Physical Debridement

Physical debridement

- Non-selective & painful
- Wet-to-dry - desiccates wound

Autolytic debridement

- Selective and more comfortable
- Wound fluid improves environment
- Enhanced debridement
- Improved granulation tissue formation
- Faster epithelialization

Moist Wound Healing - Autolytic debridement

- Patient comfort
- Extended intervals between bandage changes
- Better outcome

- Surface bacterial contamination
- Wound edge maceration



Dressings



Dressings

Hypertonic Saline

Alginates

Hydrogel

Hydrophilic Foam

PHMB

Honey

Miscellaneous Products

Hypertonic Saline

What

- 20% NaCl impregnated sponges

Method of Action

- Wet-to-dry - non-selective, mechanical debridement
- Hypertonic - dessication of bacteria and necrotic tissue
- Reduces edema

Indications

- Inflammatory phase
- High degree of
 - Contamination
 - Necrosis
 - Exudation



Hypertonic Saline

Contraindications

- Proliferative phase
- No need for non-selective debridement

How to Use It

- Frequency of bandage changes 12-72 hrs
- Used once or twice
- Preparation of wound for moist wound care products



Alginates

What

- No-adherent, non-occlusive, moisture retaining
- Hemostatic properties
- Sea-weed derived
- Can be impregnated with silver

Method of Action

- Absorbs 20-30 times its weight in moisture
- Forms gel-like substance
- Autolytic debridement

Indications

- Moderately to highly exudative wounds
- Inflammatory or proliferative phase - need granulation tissue
- Previously derided wounds
- Can be used in infected wounds



Alginates

Contraindications

- Minimally exudative wounds
- Significant necrotic debris present
- Fine granulation bed present
- **Exposed bones & tendons**

How to Use It

- Change every 24 hours to 7 days
- Loosely placed in wounds - expansion
- Pre-moisten with saline if wound is not highly exudative
 - Moisten during removal if needed
- Usually covered with semi-occlusive dressing to retain moisture
 - Polyurethane film or foam

Considerations

- Slimy & stinky!
- Granulation is often coarse and exuberant



Hydrogel

What

- Non-adherent, non-occlusive, moisture retaining
- Water based amorphous polymer gel
- Can be impregnated with silver

Method of Action

- Donate moisture to wound
- Promote granulation
- Does not inhibit epithelialization
- Alleviates pain

Indications

- Minimally to mildly exudative wounds
- Inflammatory & proliferative phase - need granulation tissue or have granulation tissue
- Dry, sloughing, necrotic wound
- Superficial/partial thickness wounds



Hydrogel

Contraindications

- Highly exudative wounds
- Exuberant granulation tissue
- Excessive necrotic debris
- Active infection

How to Use It

- Wound bed only - can macerate healthy skin
- Bandage change every 1-5 days
- Often in later stages of healing
- Usually covered with semi-occlusive dressing to retain moisture
 - Polyurethane film or foam



Hydrophilic Foam

What

- Non-adherent, hydrophilic
- Highly absorptive dressing
- Sheets +/- adhesive border

Indications

- Inflammatory or proliferative phase
- Exudative wounds
- Exuberant granulation tissue present
- Need epithelialization



Hydrophilic Foam

Contraindications

- Need for debridement
- Active infection
- Skin maceration

How to Use It

- Wound bed only - can macerate healthy skin
 - Cut to shape
- Bandage change every 3-7 days
 - Painful to remove if granulation tissue ingrowth
- Often used as additional absorptive layer
- Can be premoistened



Polyhexamethylene Biguanide (PHMB)

What

- Antimicrobial impregnated dressings
 - Gauze squares, rolls, hydrophilic foam
- Broad spectrum activity:
 - Gram positives
 - Gram negatives
 - Fungal organisms
 - Including MDR

How to Use It

- Primary layer - wet-to-dry
- Secondary layer - barrier
- Use instead of non-PHMB version



Honey

What

- Sterilized Manuka honey

Method of Action

- Osmotic effect
- Antimicrobial properties
- Immunostimulatory effect
- Anti-inflammatory action
- Autolytic debridement

Indications

- Need for debridement
- Chronic or infected wounds

What about sugar?

- Lacks some of the magic
- Osmotic effect to zap bacteria
- Can be difficult to contain
- 1cm + layer
- Cost effective wound care product



Miscellaneous Products - SSD

What

- Broad spectrum antimicrobial
 - Bacteria
 - Fungi
- Hydrophilic

Indications

- Burn wounds
- Wounds with healthy granulation tissue
- Need to antimicrobial Barrier

Contraindications

- Inhibits re-epithelialization
- Better options unless sepsis is a concern?



Miscellaneous Products

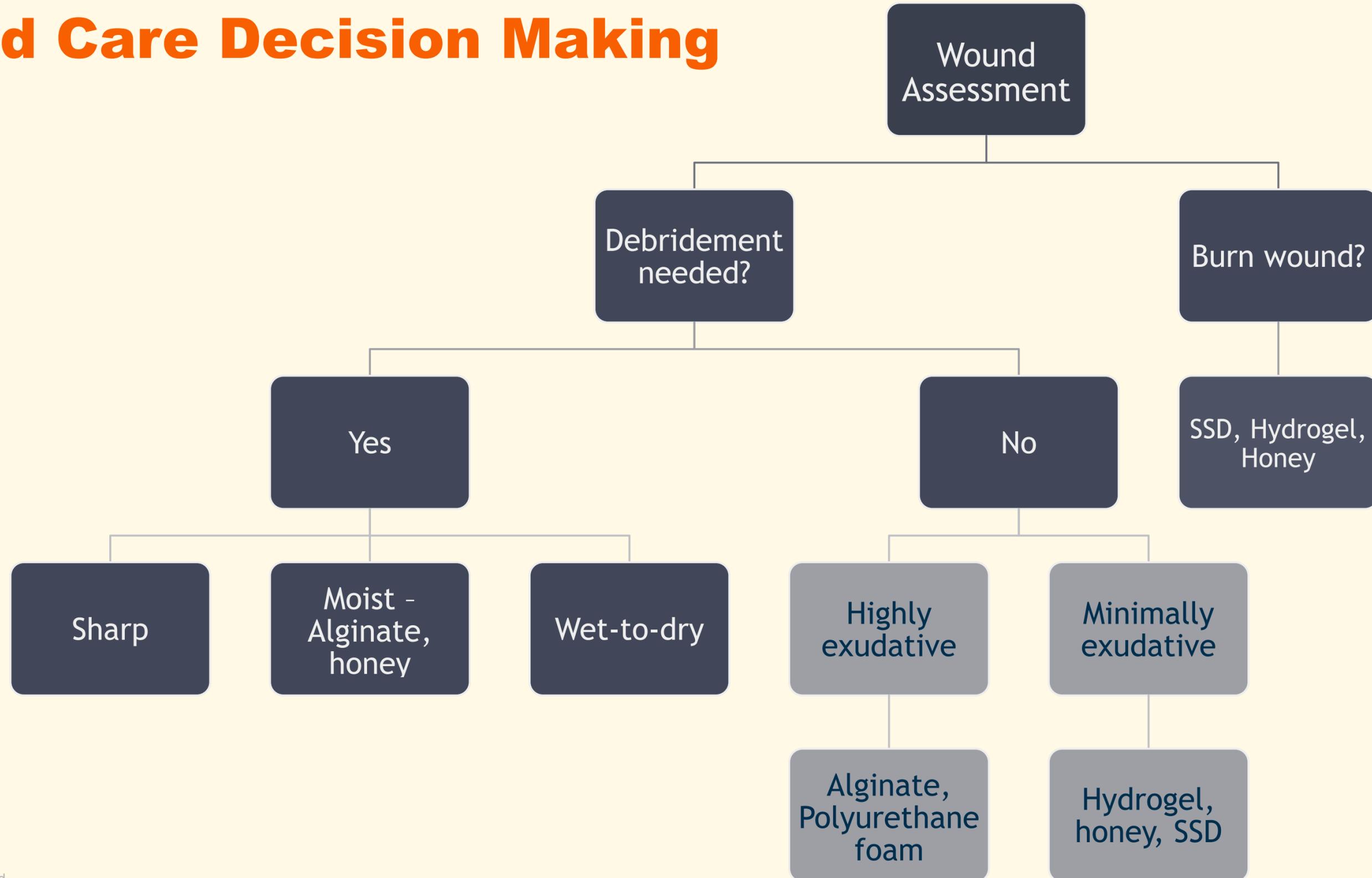
Neosporin, triple antibiotic, mupirocin ointment

- Good for preventing infection
 - Not good for treating infection
 - Petrolatum base - hydrophilic, semi-occlusive
 - Used as a barrier on surgical wounds
 - No good evidence that it works
-
- Consider in areas where hydrophobic properties are useful:
 - Perianal or perineal surgery

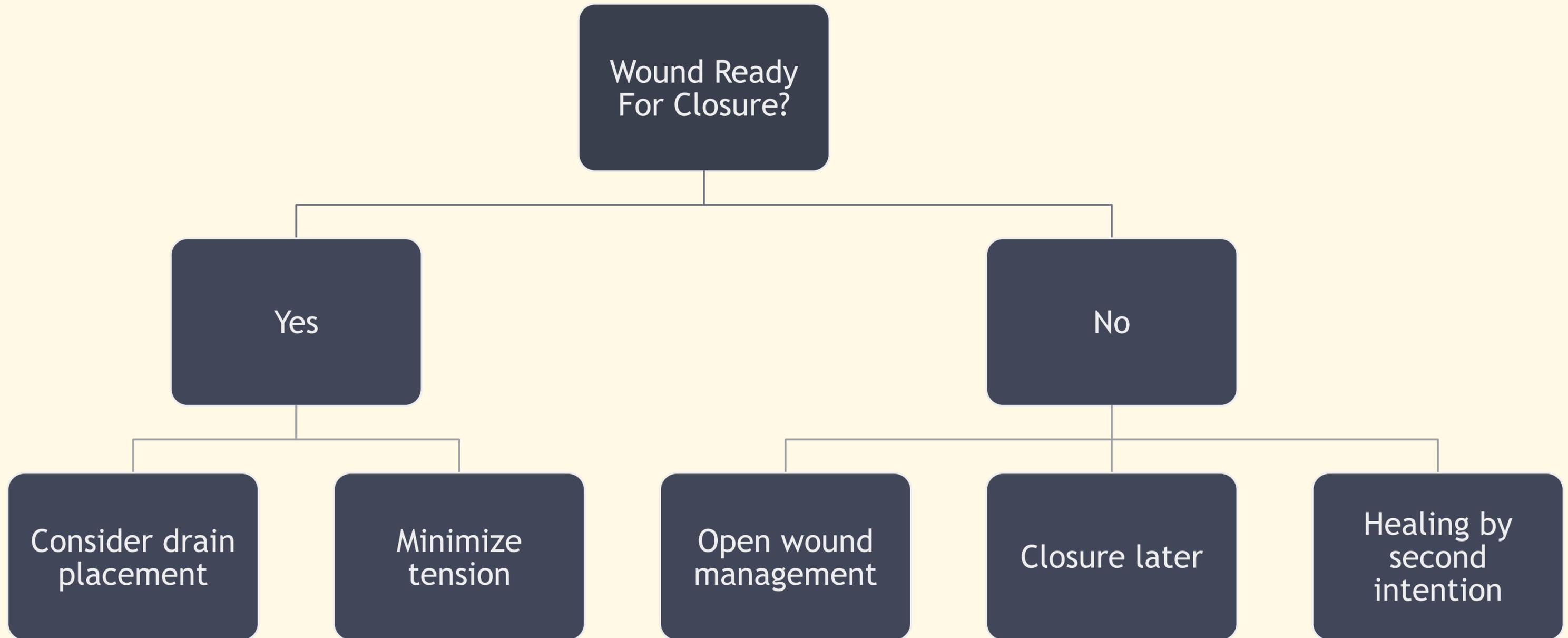
Wound Care Decision Making

Wound characteristic	Products to consider
Necrotic debris, significant contamination, moderate to large amount of exudate	Wet-to-dry, hypertonic saline, hydrogel, honey
No significant necrotic debris, significant contamination, moderate to large amount of exudate	Alginates, hydrogel, honey
Granulating but need more	Alginates, hydrogel, hydrophilic foam, honey
Healthy granulation bed, need epithelium	Hydrogel, hydrophilic foam, honey

Wound Care Decision Making



Wound Care Decision Making



Wound Care Box

Hypertonic Soaked Gauze

Curasalt - 6 x 6 ¾”

Calcium Alginate Dressing

Curasorb – 12” rope, 4x4 sheet

Hydrogel Dressing

Curafil, Carravet– 3oz. tube, 4x4 sponge

Polyurethane Foam

Hydrosorb – 4x4, 8x8

Med Honey

Tube, sheets

Non-Adherent Pads

Telfa, Release - 4”x3”, 8”x3”

Polyurethane Film

Opsite, Tegaderm, Polyskin - roll

SSD Ointment

400g tub or individual tubes

Triple Antibiotic Ointment

Kerlix AMD

4x4 sponges, roll

Wound Care Box

Bandaging Material

Cast padding – 2”, 3”, 4”, 6”

Cotton roll 1#

Kling gauze – 2”, 3”, 4”, 6”

Vetwrap – 2”, 4”

Porous tape – 1”

Elasticon - 2”, 4”

Miscellaneous

Umbilical tape

Ioban or other incise drape

Cotton tipped applicators

Tongue depressors

0 to #2 Prolene or Nylon

1000ml Pressure infusion bag

Penrose drains

200 ml JP reservoir

10F and 15 Fr fluted drain with trocar

Sterile lube packets

Questions?